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Applicant:
Herbert Kannegiesser GmbH
Kannegiesserring

32602 Vlotho

Address:
Hollerallee 73
D-28209 Bremen
Telephone +49-421-348740
Fax +49-421-342296

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Installation and washing machine for the wet treatment of laundry

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Description:

The invention relates to an installation for the washing and, if appropriate, spin-drying of laundry according to the pre-characterizing clause of Claim 1. The invention relates, furthermore, to washing machines according to the pre-characterizing clauses of Claims 18 and 24.

In commercial laundries, a plurality of washing machines are used for wet treatment, specifically, in particular, for washing and, if appropriate, for subsequent spin-drying. Machines with which the laundry can be washed and subsequently spin-dried are also designated as washer dryers in the specialized jargon. When only washing machines are referred to below for the sake of simplicity, this also means washer dryers, to which the invention likewise relates.

In commercial laundries, a plurality of washing machines are used so that different laundry batches with identical or even non-identical laundry can be washed simultaneously. For this purpose, it has been

customary hitherto to arrange the washing machines at different locations in the laundry in an island-like manner. This arrangement is selected, above all, so that the washing machines are freely accessible from all sides for repair purposes. Disadvantages of this are, however, the large amount of space required and the isolated loading of the washing machines with laundry and also the separate liquid and power supply. Above all in sterile areas, for example in hospital laundries, where the dirty laundry has to be delimited spatially from sterilized clean laundry by partitions, the individual set-up of the washing machines is highly complicated.

On the basis of the foregoing, the object on which the invention is based is to provide an installation with a plurality of washing machines for the wet treatment of laundry and also corresponding washing machines which are space-saving and, in particular, can be used in a sterile area.

An installation for achieving the object mentioned in the introduction has the features of Claim 1. Since the washing machines are arranged next to one another, they can be accommodated in a space-saving way within a laundry. The loading and unloading of the washing machine are simplified, because these are concentrated in space. Likewise, the washing machines standing next to one another can be connected to the power supply and to the liquid feed and discharge more simply, to be precise by means of shorter lines. The washing machines thus stand together in a concentrated manner and can thereby also be operated and supervised more easily.

Preferably, all the washing machines are arranged in a row, in particular a single row. The washing machines in this case stand closely next to one another with adjacent side walls. The washing machines are preferably arranged so closely next to one another that

their adjacent side walls rest against one another without a gap or run, virtually without a gap, parallel next to one another with a slight clearance. For this purpose, it is advantageous to design the side walls of the washing machines with a completely or at least for the most part plane surface. In particular, the side walls have no connections for electrical cables and liquid lines. Furthermore, the side walls have no maintenance orifices in the regions of the side walls. The washing machines can thus be placed together as closely as possible.

So that the washing machines can be supplied with electrical power and liquids, and moreover mounting and maintenance are possible, despite the fact that the side walls lie together or lie closely next to one another, the interior of the housings of the washing machines is accessible from the front side, the rear side and/or the top side. Accessibility from all three sides mentioned is preferably afforded. This ensures easy mounting and maintenance of the washing machines. Likewise, power lines and liquid lines for the feed and discharge of liquids can be connected without difficulty. Moreover, the loading and unloading of the washing machines can take place on the sides mentioned. Washing machines designed in this way fulfil the in-line arrangement of the washing machines, which is necessary for forming the installation according to the invention, with the smallest possible clearance or completely without any clearance between the adjacent side walls.

According to a preferred embodiment of the invention, the washing machines arranged in a row next to one another are arranged in the region of a partition between two rooms, in particular for the separation of a clean room. In this case, the partition has either a separating surface or at least one seal in each case between two adjacent washing machines. It may also be

envisaged, however, to arrange the washing machines to stand so closely next to one another that their adjacent side walls rest self-sealingly against one another. By virtue of the in-line arrangement of the washing machines, spatial separation between the loading region and the unloading region of the washing machines can be provided by means of essentially one simple partition. This ensures a reliable separation of, in particular, a non-sterile area from a sterile area. Above all, this separation can take place in the smallest possible space.

The installation according to the invention is designed, furthermore, in such a way that washing machines arranged next to one another can be tilted independently of one another about at least one preferably horizontal axis (tilting axis). As a result, despite their in-line arrangement, the washing machines can, if required, be brought into a loading position, unloading position and/or spin-drying position. Preferably, the washing machines can be tilted independently of one another in opposite directions, specifically, in particular, alternatively forwards or backwards. By the washing machines being arranged next to one another according to the invention, their individual tiltability, specifically even in opposite directions, is therefore not impaired. The various washing machines can be in different positions, specifically both non-tilted and tilted forwards or backwards. The washing machines arranged next to one another can thereby be operated independently of one another.

In a development of the installation according to the invention, a plurality of washing machines, preferably all the washing machines, are supplied jointly with liquid, in particular washing water, from at least one and the same tank. Such a common tank can be accommodated in a space-saving way, because each

washing machine does not have to be assigned its own tank. Preferably, also a plurality of, in particular all the washing machines, is/are assigned a common tank for receiving the liquid, in particular water, occurring during spin-drying. This may be the same tank from which the washing machines can be supplied with water. As a result of this, too, there is no need to provide a plurality of tanks and, moreover, space can also be saved thereby.

There is provision, furthermore, for preferably all the washing machines to be assigned a common control. Preferably, this common control is designed in such a way that it can control each individual washing machine independently of the others. This not only affords central operability; the control can also be simplified. Owing to the individual controllability of each individual washing machine, it is possible to operate this independently of the others. In particular, each washing machine can be operated with different washing programmes for different types of laundry, specifically even with a time offset. The washing programme and the washing duration therefore do not need to proceed identically in each washing machine.

A washing machine for achieving the object mentioned in the introduction has the features of Claim 18. Since the drum is mounted at least partially on a drive shaft of the motor, a specific mounting of the drum may be dispensed with. This mounting is assumed by the motor. In the case of a drum mounted on only one side, the motor carries the entire drum. A separate mounting of the entire drum may therefore be dispensed with. This mounting is assumed, according to the invention, by the motor. The washing machine according to the invention consequently has a more compact build. Such a washing machine is particularly suitable for the installation according to the invention with at least one row of

washing machines arranged closely next to one another, because such a drum mounting does not appreciably increase the width of the washing machine beyond the width of the drum and the row of washing machines can thereby be as small as possible.

There is provision, furthermore, for the drum of the washing machine to be connected releasably to the drive shaft of the motor. In this way, the drum and the motor can be mounted and demounted separately. There is therefore no need for the washing machine to be accessible laterally, with the result that it is possible to arrange the washing machines directly next to one another in a row, as is provided by the installation according to the invention.

The releasable connection between the drum and the drive shaft takes place preferably frictionally and/or non-positively. Such a connection can also be mounted and demounted in a simple way even under confined conditions.

There is provision, furthermore, for the releasable connection between the motor and the drum to be designed in such a way that it is suitable for the absorption or transmission of torsional forces (drive forces) and bending moments. This type of releasable connection takes account of the special conditions of force in washing machines, particularly when unbalances causing bending moments occur during spin-drying at high rotational speeds. Moreover, bending moments also arise when, as is permitted by the connection according to the invention, the drum is mounted on only one end face, specifically on the output shaft of the motor.

In a particularly advantageous development of the invention, the releasable connection is designed as tension-ring set which is arranged in a pot-like receptacle of part of the end wall of the drum. This

pot-like receptacle of the tension-ring set likewise contributes to providing a compact construction of the washing machine. In particular, as a result, the washing machine can be designed to be as narrow as possible, because the frictional or non-positive releasable connection of the output shaft of the motor to the drum, the said connection being formed by at least one tension-ring set, has been shifted virtually into the drum, the bowl-like design of the corresponding region of the end wall of the drum allowing a protected accommodation of the respective tension-ring set within the contour lines of the drum.

A further washing machine for achieving the object mentioned in the introduction has the features of Claim 24. Since the basic stand has a tilting stand for tilting the washing machine in opposite directions, it is possible to bring the washing machine into various tilting positions, particularly for unloading and loading, the tilting stand assigned to the basic stand allowing a highly stable hold of the washing machine even in the state tilted to each side.

In the preferred embodiment of the basic stand, the tilting stand is formed from two tilting-stand parts and, furthermore, the basic stand is also provided with a plinth stand. It is thereby possible to tilt the tilting stand with respect to the plinth stand in one direction about a first horizontal axis, whilst one tilting-stand part can be tilted with respect to the other tilting-stand part about a second horizontal axis which runs parallel to the first axis. Two opposite tilting possibilities are thereby provided for the washing machine in a simple way, the opposite horizontal tilting axes for connecting the two tilting-stand parts and for connecting the tilting stand to the plinth stand ensuring a reliable and essentially play-free guidance of the individual tilting-stand parts and of the entire tilting stand with respect to the plinth

stand.

Preferred exemplary embodiments of the installation according to the invention and of a washing machine serving for forming the latter are explained in more detail below with reference to the drawings in which:

Fig. 1 shows a front view of the installation according to the invention,

Fig. 2 shows a top view of the installation according to the invention,

Fig. 3 shows a rear view of an individual washing machine for forming the installation shown in Figs. 1 and 2,

Fig. 4 shows a side view of the washing machine of Fig. 3,

Fig. 5 shows a side view similar to Fig. 4, with a washing machine tilted into an unloading position,

Fig. 6 shows a side view similar to Figs. 4 and 5, with a washing machine tilted into a loading position, and

Fig. 7 shows a part-section of a drum of the washing machine with drive.

The invention relates to a plant for the washing of laundry in commercial laundries. This plant, designated below as an installation, has a row of machine machines 10. In the exemplary embodiment shown, all the washing machines 10 are designed identically, in particular have in each case a drum 39 driveable in rotation, with a loading orifice 22 and with an unloading orifice 20. The washing machines 10 shown here serve for washing

and subsequently spin-drying the laundry. The washing machines 10 are therefore, to be precise, washer dryers. The invention is suitable, however, for washing machines which do not spin-dry the laundry.

The particular feature of the installation according to the invention is that a plurality of washing machines 10, specifically, in the exemplary embodiment shown, identical washing machines 10, are arranged next to one another in a row. Figs. 1 and 2 illustrate by way of example three washing machines 10 arranged next to one another. The number of washing machines 10 for forming the installation according to the invention may vary as desired, however, so that two washing machines 10 or more than three washing machines 10 are arranged next to one another. The washing machines 10 are arranged next to one another in such a way that mutually facing side walls 11 of the parallelepipedal housings 12 of adjacent washing machines 10 rest against one another or, as in the exemplary embodiment shown, lie next to one another with a small gap 13. The essentially plane side walls 11 in this case run parallel to one another. Adjacent side walls 11 of washing machines 10 lying next to one another thereby delimit opposite sides of the gap 13.

Each washing machine 10 has a basic stand 14 under its housing 12. The basic stands 14 extend over the region of the respective washing machine 10, and, in addition, preferably each basic stand 14 has approximately the same base area as the housing 12. Adjacent washing machines 10 can be connected to one another via their basic stands 14, in particular parts of the basic stands 14. It may also be envisaged to provide a common basic stand on which all washing machines 10 are mounted. In this case, the individual washing machines 10 do not have their own basic stand.

The installation shown in the figures is intended for

the treatment of laundry which must be sterile after washing. For example, such an installation is used in hospital laundries, but also in laboratories. In this case, the washing machines 10 form a kind of lock between a non-sterile area 15, in which the still unwashed laundry is located, and a sterile area 16 for the washed and sterilized laundry. In the exemplary embodiment shown, the non-sterile area 15 and the sterile area 16 are separated from one another in the surroundings of the washing machines 10 by a partition 17. The partition 17 has separating surfaces 18 between the washing machines 10. These separating surfaces seal off the gaps 13 between adjacent side walls 11 of washing machines 10 standing next to one another. The separating surfaces 18 may alternatively be formed by strip-shaped seals in the gap 13 between adjacent washing machines 10.

A front side 19 of each washing machine 10 faces the sterile area 16. Each washing machine 10 has in the region of the front side 19 an unloading orifice 20 through which the washed, spin-dried and, if appropriate, sterilized laundry leaves the respective washing machine 10. Each washing machine 10 has a loading orifice 22 on the top side 21. The loading of the washing machine 10 takes place with the aid of a loading funnel 23 which is arranged above the respective washing machine 10 and through which the laundry to be washed passes via the loading orifice 22 into the respective washing machine 10. Each washing machine 10 is assigned its own loading funnel 23. It may also be envisaged, however, to provide a single loading funnel 23 for all the washing machines 10. Such a loading funnel 23 is moveable along the row of washing machines 10 arranged next to one another, so that the loading funnel 23 comes into the vicinity of the loading orifice 22 of that washing machine 10 which is to be loaded in each case with laundry to be washed.

Each washing machine is constructed in such a way that it is accessible only from the top side 21 and the front side 19 during operation. Furthermore, the construction of each washing machine 10 is selected such that all the components of the washing machine 10 are accessible from the front side 19, the top side 21 and/or the rear side 24 for mounting, maintenance and repair purposes. There is no need for the respective washing machine 10 to have accessibility from the side walls 11, so that, for mounting, maintenance and repair purposes, the washing machines 10 can remain in the row, that is to say there is no need for an individual washing machine 10 or else a plurality of washing machines 10 to be moved out of place.

All the washing machines 10 are assigned at least one common tank. This tank serves for receiving liquid, in particular water serving for washing the laundry. All the washing machines 10 can be supplied with water, as required, out of the tank. It may also be envisaged that water occurring in each washing machine 10 during spin-drying is returned to the tank again. However, a separate tank for water discharged from the laundry during spin-drying may also be provided.

The control of all the washing machines 10 preferably takes place centrally. Only a single control is therefore necessary for all the washing machines 10. However, this control is designed in such a way that it makes it possible to operate each washing machine 10 independently of the others. As a result, different washing operations can take place in individual washing machines 10. Nor do the washing machines 10 need to be operated simultaneously.

The basic stand 14 of each washing machine 10 is designed in a special way. In the exemplary embodiment shown, the basic stands 14 and also the washing machines 10 are designed identically. Accordingly, each

basic stand 14 is composed of a lower plinth stand 25 and of a tilting stand 26 arranged above it. The plinth stand 25 rests on the floor of the laundry. According to the invention, the tilting stand 26 arranged above it is formed from two tilting-stand parts 27 and 28. A lower tilting-stand part 27 is connected to the plinth stand 25 about a horizontal tilting axis 29. The tilting axis 29 runs in the longitudinal direction of the row of washing machines 10, that is to say transversely to the side walls 11. The tilting axis 29 is located at the rear end of the plinth stand 25 and of the lower tilting-stand part 27, the said rear end being directed towards the rear side 24 of the housing 12 of the respective washing machine 10. The two tilting-stand parts 27 and 28 are connected to one another by means of a further horizontal tilting axis 30. This tilting axis 30 is located at the front end region of the tilting-stand parts 27 and 28, the said front end region pointing towards the front side 19 of the housing 12 of each washing machine 10. The tilting axes 29 and 30 assigned to opposite ends of the respective washing machine 10 run parallel to one another.

The tilting stand 26 with the two tilting-stand parts 27 and 28 is tiltable about the tilting axis 29 with respect to the plinth stand 25 by at least one actuating means, this being, in the exemplary embodiment shown, a pressure-medium cylinder 31, for example a pneumatic cylinder. A piston of the pressure-medium cylinder 31 is articulated pivotably, but otherwise fixedly, on a carrying arm 32 connected to the plinth stand 25. One piston-rod end 33 of the pressure-medium cylinder 31 is articulated on a pivoting arm 34 which is fastened to the rear side of the lower tilting-stand part 27 of the tilting stand 26. By the pressure-medium cylinder 31 being extended, the tilting stand 26 with the two tilting-stand parts 27 and 28 is pivoted about the tilting axis 29 with

respect to the plinth stand 25 into the position shown in Fig. 6. In this case, at least the drum 39 of the washing machine 10 is tilted backwards into a loading position. In this case, the laundry to be washed can be transported via the loading funnel 23 into the loading orifice 22 of the drum 39 of the washing machine 10.

Two further, preferably parallel actuating means, such as, for example, pressure-medium cylinders 35 which are preferably also pneumatic cylinders, serve for pivoting the upper tilting-stand part 28 with respect to the lower tilting-stand part 27. The pressure-medium cylinders 35 are arranged behind the housing 12 of the washing machine 10. For this purpose, a piston part of each pressure-medium cylinder 35 is mounted pivotably on a carrying arm 36. The carrying arm 36 is connected fixedly to a rear end of the upper tilting-stand part 28. A piston-rod end 37 of each pressure-medium cylinder 35 is articulated on a rear end of the lower tilting-stand part 27. As shown in Fig. 5, by the pressure-medium cylinder 35 being extended, at least the drum 39 of the washing machine 10, together with the upper tilting-stand part 28, can be pivoted forwards about the tilting axis 30 with respect to the lower tilting-stand part 27. In this forward-pivoted position, unloading of the drum 39 of the washing machine 10 takes place through the unloading orifice 20 inclined obliquely forwards and downwards.

A reversal of the functions of the tilting-stand parts 27, 28 may also be envisaged. Then, the entire tilting stand 26, that is to say a pivoting of both tilting-stand parts 27, 28, serves for tilting the washing machine 10, in particular at least the drum 39, into the unloading position. By only the upper tilting-stand part 28 being pivoted with respect to the lower tilting-stand part 27, in particular the drum 39 then passes into the loading position. In the alternative mentioned, the tilting axes 29, 30 are arranged in a

correspondingly different way.

Other actuating means, for example motor-operated spindles or racks, may also be provided instead of the pressure-medium cylinders 31, 35.

Figs. 3 and 4 show the washing machine 10 in its non-pivoted basic position. In this position, the washing and also the spin-drying of the laundry take place. Particularly for the spin-drying of the laundry, the housing 12 of the washing machine 10 is mounted elastically or resiliently on the basic stand 14, to be precise on the upper tilting-stand part 28, specifically, in the exemplary embodiment shown, by means of a plurality of pneumatic springs 38. Preferably, for example, two rows running parallel in the longitudinal direction of the washing machine 10, that is to say in the direction of the longitudinal mid-axis 40, and consisting in each case of a plurality of pneumatic springs 38 lying one behind the other are provided. By the pneumatic springs 38 in each case lying one behind the other in a row being inflated to a different extent, in particular the drum 39 of the washing machine 10 can be tilted, specifically both into the loading position and into the unloading position. This may take place in order to overlay or assist the tilting of the washing machine 10 or drum 39 occurring by means of the tilting stand 26, but also as a substitute for the tilting stand 26 which, if appropriate, may thus be dispensed with.

A cylindrical drum 39 arranged in the housing 12 of the washing machine 10 can be driven in rotation about a central longitudinal mid-axis 40 by means of a direct drive in the form of an electric motor 41. The drum 39 is directly mounted, on its end face 42 directed towards the electric motor 41, on a drive shaft 43 of the electric motor 41. The drive shaft 43 also carries a rotor 44 of the electric motor 41. The drive shaft 43

is mounted in the motor housing 45 by means of rolling bearings 46, 47 which are assigned to opposite end faces of the motor housing 45. A rolling bearing 46 facing the drum 39 is designed in such a way that it absorbs the forces of the drum 39, in particular also unbalance forces which occur during the spin-drying of the laundry.

The drive shaft 43 of the electric motor 41 projects with a shaft stub 48 out of that end face 49 of the motor housing 45 which points towards the drum 39. The electric motor 41 is at the same time fastened, to be precise releasably screwed, with the end face 49, to a wall 50 of the housing 12, the said wall lying to the rear side 24 of the washing machine 10. That wall 50 of the housing 12 which points towards the rear side 24 of the washing machine 10 therefore carries the electric motor 41 together with the drum 39 mounted on the drive shaft 43 of the latter. In this case, a strut 51, which extends from the wall 50 as far as the rear end face 52 of the motor housing 45, serves for stabilizing the electric motor 41 on the wall 50.

The shaft stub 48 of the drive shaft 43 of the electric motor 41 is connected releasably to the drum 39, specifically to an end face 42 of the drum 39 which points towards the electric motor 41. For this purpose, a hub 53, preferably formed from cast steel, is assigned to the drum 39 in a middle region of the end face 42. The hub 53 has an inner passage bore 54 which can be plugged or pushed onto the shaft stub 48. An annular receptacle extends concentrically around the passage bore 54 of the hub 53. The annular receptacle forms, within the hub 53, an annular space 55 which lies in the drum 39 and which is accessible from inside the drum 39, that is to say from that end face 42 of the drum 39 which is directed away from the electric motor 41. Arranged in the annular space 55 is a tension-ring set 56. The latter serves for the

releasable connection of the drum 39 to the drive shaft 43 of the electric motor 41. When the tension ring 56 is tensioned, it presses together a sleeve portion 57 of the hub 53, the said sleeve portion surrounding the passage bore 54 of the hub 53, with the result that the sleeve portion 57 of reduced diameter makes a frictional and non-positive connection of the hub 53 to the shaft stub 48 of the drive shaft 43. By the tension ring 56 being released, this frictional and non-positive connection between the drum 39 and the drive shaft 43 of the electric motor 41 can be released. Both the tension ring 56 and the assignment of the latter to the outer circumference of the sleeve portion 57 of the hub 53, the said sleeve portion sitting on the shaft stub 48 of the drive shaft 43, provide, between the drive shaft 43 and the drum 39, a releasable connection which can not only absorb torsional forces for transmitting the drive torque of the electric motor 41 to the drum 39, but also bending moments. These bending moments arise, on the one hand, due to the only one-sided mounting of the drum 39 on the electric motor 41 and, on the other hand, due to centrifugal forces which occur particularly during the spin-drying of the laundry in the drum 39.

After the mounting and after the tensioning of the tension ring 56, that is to say after the connection of the drum 39 to the shaft stub 48 of the drive shaft 43 of the electric motor 41 has taken place, the annular space 55 open towards the inside of the drum 39 is closed, specifically preferably in a liquid-tight manner, by means of a closing disc 58. The closing disc 58 is firmly screwed and, moreover, sealed off on suitable end faces of the hub 53 and/or of the shaft stub 58.

Applicant:
Herbert Kannegiesser GmbH
Kannegiesserring

32602 Vlotho

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KAN-377

List of reference symbols

10	Washing machine	36	Carrying arm
11	Side wall	37	Piston-rod end
12	Housing	38	Pneumatic spring
13	Gap	39	Drum
14	Basic stand	40	Longitudinal mid-axis
15	Non-sterile area	41	Electric motor
16	Sterile area	42	End face
17	Partition	43	Drive shaft
18	Separating surface	44	Rotor
19	Front side	45	Motor housing
20	Unloading orifice	46	Rolling bearing
21	Top side	47	Rolling bearing
22	Loading orifice	48	Shaft stub
23	Loading funnel	49	End face
24	Rear side	50	Wall
25	Plinth stand	51	Strut
26	Tilting stand	52	End face
27	Tilting-stand part (lower)	53	Hub
		54	Passage bore
28	Tilting-stand part (upper)	55	Annular space
		56	Tension ring
29	Tilting axis	57	Sleeve portion
30	Tilting axis	58	Closing disc
31	Pressure-medium cylinder		
32	Carrying arm		
33	Piston-rod end		
34	Pivoting arm		
35	Pressure-medium cylinder		